

L1 1 S US 20070078279/PN

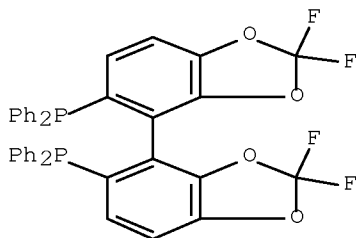
FILE 'REGISTRY' ENTERED AT 09:50:40 ON 03 DEC 2009

L2 1 S 10049-08-8/RN  
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FILE 'REGISTRY' ENTERED AT 09:50:52 ON 03 DEC 2009

L3 1 S 503538-69-0/RN

L3 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2009 ACS on STN  
 RN 503538-69-0 REGISTRY  
 CN Phosphine, 1,1'-[(4R)-2,2,2',2'-tetrafluoro[4,4'-bi-1,3-benzodioxole]-5,5'-diyl]bis[1,1-diphenyl- (CA INDEX NAME)  
 OTHER CA INDEX NAMES:  
 CN Phosphine, [(4R)-2,2,2',2'-tetrafluoro[4,4'-bi-1,3-benzodioxole]-5,5'-diyl]bis[diphenyl- (9CI)  
 OTHER NAMES:  
 CN (R)-Difluorophos  
 MF C38 H24 F4 O4 P2  
 SR CA  
 LC STN Files: CA, CAPLUS, CASREACT, CHEMCATS, CSCHEM, TOXCENTER, USPAT2, USPATFULL  
 DT.CA CAplus document type: Journal; Patent  
 RL.P Roles from patents: PREP (Preparation); RACT (Reactant or reagent); USES (Uses)  
 RL.NP Roles from non-patents: PREP (Preparation); PRP (Properties); RACT (Reactant or reagent); USES (Uses)

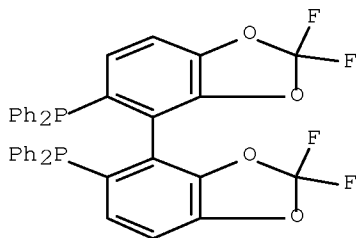


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FILE 'REGISTRY' ENTERED AT 09:51:14 ON 03 DEC 2009

L4 1 S 503538-70-3/RN

L4 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2009 ACS on STN  
 RN 503538-70-3 REGISTRY  
 CN Phosphine, 1,1'-[(4S)-2,2,2',2'-tetrafluoro[4,4'-bi-1,3-benzodioxole]-5,5'-diyl]bis[1,1-diphenyl- (CA INDEX NAME)  
 OTHER CA INDEX NAMES:  
 CN Phosphine, [(4S)-2,2,2',2'-tetrafluoro[4,4'-bi-1,3-benzodioxole]-5,5'-diyl]bis[diphenyl- (9CI)  
 OTHER NAMES:  
 CN (S)-DIFLUORPHOS  
 MF C38 H24 F4 O4 P2  
 SR CA  
 LC STN Files: CA, CAPLUS, CASREACT, CHEMCATS, CSCHEM, TOXCENTER, USPAT2, USPATFULL  
 DT.CA CAplus document type: Conference; Journal; Patent  
 RL.P Roles from patents: PREP (Preparation); RACT (Reactant or reagent); USES (Uses)  
 RLD.P Roles for non-specific derivatives from patents: PREP (Preparation); USES (Uses)  
 RL.NP Roles from non-patents: PREP (Preparation); PRP (Properties); RACT (Reactant or reagent); USES (Uses)  
 RLD.NP Roles for non-specific derivatives from non-patents: USES (Uses)



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 L5 1 S 19486-93-2/RN  
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 SET NOTICE LOGIN DISPLAY  
 FILE 'REGISTRY' ENTERED AT 09:51:53 ON 03 DEC 2009  
 L6 1 S 86728-85-0/RN  
 SET NOTICE 1 DISPLAY  
 SET NOTICE LOGIN DISPLAY

FILE 'REGISTRY' ENTERED AT 09:52:14 ON 03 DEC 2009  
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 L8 24 S L7 SSS SAM  
 L9 483 S L7 SSS FULL

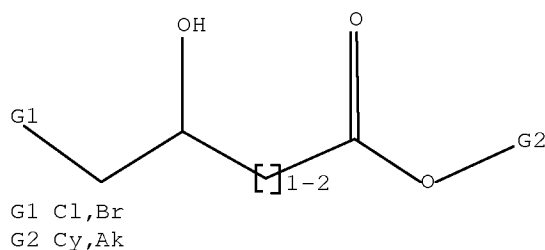
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 L10 STRUCTURE UPLOADED

L10 STRUCTURE UPLOADED

=> d l10

L10 HAS NO ANSWERS

L10 STR



L11 11 S L10 SSS SAM  
 L12 208 S L10 SSS FULL

FILE 'HCAPLUS' ENTERED AT 09:56:21 ON 03 DEC 2009  
 L13 658 S L12  
 L14 5 S L13 AND (L3 OR L4)  
 L15 1 S L14 AND (PY<2004 OR AY<2004 OR PRY<2004)  
 L16 4 S L14 NOT L15

FILE 'HCAPLUS' ENTERED AT 10:00:56 ON 03 DEC 2009  
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 SET EXPAND CONTINUOUS  
 L17 29 S E1-E4  
 L18 0 S L17 AND L12\  
 L19 4 S L17 AND L12  
 L20 4 S L19 NOT L16  
 L21 4 S L20 NOT L15

L21 ANSWER 1 OF 4 HCAPLUS COPYRIGHT 2009 ACS on STN

TI First modular synthesis of dissymmetric biaryldiphosphine ligands allowing

tunable steric and electronic effects

AB The first modular synthesis of a family of Cl-sym. 1,1'-biphenyl-2-2'-diphosphine ligands is presented. Starting from 2,2',6,6'-tetrabromo-1,1'-biphenyl, the resolvable intermediate, 2',6-dibromo-6'-(trimethylsilyl)-1,1'-biphenyl-2-ol (12) was prepared in two steps by silylation-hydroxylation reaction sequence. Optical resolution of rac-12 was achieved by preparative HPLC on chiral stationary phase column. Alkylation of both enantiomers of 12 afforded methoxy derivs., 2,2'-dibromo-6-methoxy-6'-(trimethylsilyl)-1,1'-biphenyls [(R)-17, (S)-17]. Chiral bis-diphenylphosphines 2,2'-bis(diphenylphosphino)-6-methoxy-1,1'-

biphenyls (2) were prepared by BuLi/Ph<sub>2</sub>PCl phosphination and desilylation. Unsym. 2,2'-diphosphines, 2-(R<sub>1</sub>2P)-2'-(R<sub>2</sub>2P)-6-methoxy-1,1'-biphenyls (1, R<sub>1</sub> = Ph, R<sub>2</sub> = Cy; 3, R<sub>1</sub> = R<sub>2</sub> = Cy; 4, R<sub>1</sub> = Cy, R<sub>2</sub> = Ph) were prepared in racemic form starting from 2-bromo-2',6-diiodo-6'-methoxy-1,1'-biphenyl by consequent phosphination and debromination; compds. 1-4 were prepared on gram scale and resolved into individual enantiomers by chiral preparative HPLC. Their synthesis is based on unprecedented highly regioselective halogen/metal interconversions on a common polybrominated biaryl precursor; the reaction sequence makes easily available the diphosphine ligands carrying only one substituent at the 6-position and two phosphine substituents at the 2- and 2'-positions; the two phosphine substituents may be identical or different. Asym. hydrogenation of acetoacetate, 4-chloroacetoacetate, di-Me itaconate, (Z)- $\alpha$ -acetamidocinnamate using Ru/L and Rh/L catalysts (L = 1-4) gave the products with good to quant. yields and moderate to high ee values.

ACCESSION NUMBER: 2007:230967 HCAPLUS Full-text  
DOCUMENT NUMBER: 147:365553  
TITLE: First modular synthesis of dissymmetric  
biaryldiphosphine ligands allowing tunable  
steric and  
electronic effects  
AUTHOR(S): Leroux, Frederic R.; Mettler, Hanspeter  
CORPORATE SOURCE: Laboratoire de Stereochimie (UMR CNRS 7509),  
Universite Louis Pasteur (ECPM), Strasbourg,  
67087/2,  
Fr.  
SOURCE: Advanced Synthesis & Catalysis (2007), 349(3),  
323-336  
CODEN: ASCAF7; ISSN: 1615-4150  
PUBLISHER: Wiley-VCH Verlag GmbH & Co. KGaA  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
OTHER SOURCE(S): CASREACT 147:365553  
CC 29-7 (Organometallic and Organometalloidal Compounds)  
Section cross-reference(s): 21  
IT 10488-69-4F  
RL: SPN (Synthetic preparation); PREP (Preparation)  
(chiral, 80% ee; modular synthesis of axial-chiral unsym.  
6-methoxy-1,1'-biphenyl-2,2'-diphosphines with tunable  
electronic and  
steric effects as asym. hydrogenation catalysts)  
OS.CITING REF COUNT: 6 THERE ARE 6 CAPLUS RECORDS THAT CITE THIS  
RECORD  
(6 CITINGS)  
REFERENCE COUNT: 54 THERE ARE 54 CITED REFERENCES AVAILABLE  
FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE  
FORMAT

L21 ANSWER 2 OF 4 HCAPLUS COPYRIGHT 2009 ACS on STN

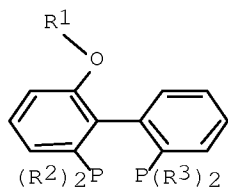
TI Ligand tailoring: the first modular assembly of atropoisomeric  
biarylbisphosphine ligands

AB Unsym. substituted axial-chiral 1,1'-biphenyl-2,2'-diphosphines  
were prepared starting from 2,2',6,6'-tetrabromo-1,1'-biphenyl by  
highly selective stepwise lithiation, phosphination, halogenation

and substitution reactions; the biphenyl diphosphines were resolved into enantiomers and examined as catalysts for asym. hydrogenation of C:C and C:O double bonds. Using the "dummy" removable bromo substituent at 6'-position, undesirable planarization and cyclization of biphenyl monophosphine intermediate into dibenzophospholes was avoided. Monoborylation, oxidation and methylation of 2,2',6,6'-tetrabromo-1,1'-biphenyl gave 2,2',6'-tribromo-2-methoxy-1,1'-biphenyl (5), which was converted to 6-methoxy-2-(R1P)-2'-(R2P)-1,1'-biphenyls (1-4; 1 R1 = R2 = Ph; 2 R1 = R2 = Cy; 3 R1 = Cy, R2 = Ph; 4 R1 = Ph, R2 = Cy) by stepwise lithiation-phosphination, lithiation-halogenation and lithiation-hydrolysis reactions. After resolution on chiral column, the ligands were tested in benchmark hydrogenation reactions of (Z)- $\alpha$ -acetamidocinnamate, di-Me itaconate and acetoacetate, affording good to excellent enantioselectivity.

ACCESSION NUMBER: 2006:341383 HCAPLUS Full-text  
DOCUMENT NUMBER: 145:28069  
TITLE: Ligand tailoring: the first modular assembly of atropoisomeric biarylbisphosphine ligands  
AUTHOR(S): Leroux, Frederic; Mettler, Hanspeter  
CORPORATE SOURCE: Laboratoire de Stereochimie (UMR CNRS 7509),  
Universite Louis Pasteur (ECPM), Strasbourg,  
67087/2,  
Fr.  
SOURCE: Synlett (2006), (5), 766-770  
CODEN: SYNLES; ISSN: 0936-5214  
PUBLISHER: Georg Thieme Verlag  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
OTHER SOURCE(S): CASREACT 145:28069  
CC 29-7 (Organometallic and Organometalloidal Compounds)  
IT 1604-11-1P, Dimethyl methylsuccinate 2018-61-3P 3618-96-0P  
5405-41-4P, Ethyl  $\beta$ -hydroxybutyrate 10488-69-4P  
RL: SPN (Synthetic preparation); PREP (Preparation)  
(modular synthesis and resolution of unsym. axial-chiral  
1,1'-biphenyl-2,2'-diphosphines as chiral ligands for asym.  
hydrogenation)  
OS.CITING REF COUNT: 9 THERE ARE 9 CAPLUS RECORDS THAT CITE THIS  
RECORD  
(10 CITINGS)  
REFERENCE COUNT: 45 THERE ARE 45 CITED REFERENCES AVAILABLE  
FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE  
FORMAT

L21 ANSWER 3 OF 4 HCAPLUS COPYRIGHT 2009 ACS on STN  
TI Preparation of asymmetrically substituted biaryldiphosphines and  
their use  
as cocatalysts for transition metal catalyzed enantioselective  
hydrogenation  
GI



I

AB Asym. substituted biaryldiphosphine ligands I (R1 = C1-6-alkyl or C3-10-cycloalkyl optionally substituted with one or more halogen atoms; R2 and R3 are equal and are C5-10-cycloalkyl or C1-6-alkyl, or R2 is C5-10-cycloalkyl or C1-6-alkyl, and R3 is aryl optionally substituted with one or more substituents selected from the group consisting of halogen atoms, nitro, amino, C1-6-alkyl, C1-6-alkoxy and di-C1-6-alkylamino groups, and each C1-6-alkyl, C1-6-alkoxy, di-C1-6-alkylamino and C5-10-cycloalkyl group in R2 and R3 optionally being substituted with one or more halogen atoms, from 2,2',6,6'-tetra-bromobiphenyl) were prepared by a sequence of bromine-metal exchanges and subsequent reactions. Thus, lithiation of 2',6-dibromo-2-methoxy-1,1'-biphenyl (preparation given) with BuLi followed by phosphination with chlorodicyclohexylphosphine in THF gave 74% title compound, 2',6-bis(dicyclohexylphosphino)-2-methoxy-1,1'- biphenyl (ligand 1). RuCl3/(-)ligand 1 catalyzed enantioselective hydrogenation of Et acetoacetate gave (R)-Et 3-hydroxybutyrate.

ACCESSION NUMBER: 2006:31411 HCAPLUS Full-text  
DOCUMENT NUMBER: 144:129105  
TITLE: Preparation of asymmetrically substituted biaryldiphosphines and their use as cocatalysts for transition metal catalyzed enantioselective hydrogenation  
INVENTOR(S): Mettler, Hanspeter; Leroux, Frederic; Schlosser, Manfred  
PATENT ASSIGNEE(S): Lonza AG, Switz.  
SOURCE: PCT Int. Appl., 29 pp.  
CODEN: PIXXD2  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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WO 2006002731	A1	20060112	WO 2005-EP6065	
20050606				
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KZ,  
 NA, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,  
 SK, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG,  
 YU, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN,  
 RW: ZA, ZM, ZW  
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 CF, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ,  
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 EP 1778704 A1 20070502 EP 2005-756224  
 20050606  
 EP 1778704 B1 20081126  
 R: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU,  
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 CN 1972952 A 20070530 CN 2005-80021088  
 20050606  
 JP 2008503508 T 20080207 JP 2007-517125  
 20050606  
 BR 2005012633 A 20080325 BR 2005-12633  
 20050606  
 AT 415406 T 20081215 AT 2005-756224  
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 ES 2318502 T3 20090501 ES 2005-756224  
 20050606  
 IN 2006DN07832 A 20070817 IN 2006-DN7832  
 20061222  
 KR 2007029264 A 20070313 KR 2007-701925  
 20070125  
 US 20090105505 A1 20090423 US 2008-630109  
 20081124  
 PRIORITY APPLN. INFO.: EP 2004-14908 A  
 20040625 WO 2005-EP6065 W  
 20050606  
 OTHER SOURCE(S): CASREACT 144:129105; MARPAT 144:129105  
 IC ICM C07F009-50  
 CC 29-7 (Organometallic and Organometalloidal Compounds)  
 Section cross-reference(s): 21, 67  
 IT 2018-61-3P 3618-96-0P 17480-69-2P 22644-27-5P 24915-95-5P  
 86728-85-0P  
 RL: SPN (Synthetic preparation); PREP (Preparation)  
 (preparation of asym. substituted biaryldiphosphines and their  
 use as  
 cocatalysts for transition metal catalyzed enantioselective  
 hydrogenation)  
 OS.CITING REF COUNT: 3 THERE ARE 3 CAPLUS RECORDS THAT CITE THIS  
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(3 CITINGS)

REFERENCE COUNT: 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS

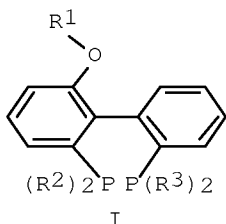
RECORD. ALL CITATIONS AVAILABLE IN THE RE  
FORMAT

L21 ANSWER 4 OF 4 HCAPLUS COPYRIGHT 2009 ACS on STN

TI Preparation of asymmetrically substituted biaryldiphosphines as  
ligands

for enantioselective hydrogenation

GI



AB Provided is a process for preparation of asym. substituted biaryldiphosphine ligands I (R1 = C1-6-alkyl, C3-10-cycloalkyl optionally substituted with one or more halogen atoms; R2, R3 = aryl, C5-10-cycloalkyl, C1-6-alkyl, or R2 = C5-10-cycloalkyl, C1-6-alkyl; R3 = aryl optionally substituted with one or more substituents selected from the group consisting of halo, nitro, amino, C1-6-alkyl, C1-6-alkoxy, and di-C1-6-alkylamino groups, and each C1-6-alkyl, C5-10-cycloalkyl, C1-6-alkoxy and di-C1-6-alkylamino group in R2 and R3 optionally being substituted with one or more halogen atoms, from 2,2',6,6'-tetrabromobiphenyl) by a sequence of bromine metal exchanges and subsequent reactions. Thus, phosphination of 2,6,6-tribromo-2'-methoxy-1,1'-biphenyl (preparation given) with Ph<sub>2</sub>PCl followed by isomerization gave 2',6-bis(diphenylphosphinyl)-2-methoxy-1,1'-biphenyl (ligand 1); RuCl<sub>3</sub>/(+)-ligand 1-catalyzed hydrogenation of Et acetoacetate in EtOH at 50° gave (S)-Et 3-hydroxybutyrate in 6h.

ACCESSION NUMBER: 2006:31400 HCAPLUS Full-text

DOCUMENT NUMBER: 144:129104

TITLE: Preparation of asymmetrically substituted  
biaryldiphosphines as ligands for  
enantioselective

hydrogenation

INVENTOR(S): Mettler, Hanspeter; Leroux, Frederic;  
Schlosser, Manfred

PATENT ASSIGNEE(S): Lonza AG, Switz.

SOURCE: PCT Int. Appl., 35 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:



PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2006002730	A1	20060112	WO 2005-EP6064	
20050606				
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EP 1761549	A1	20070314	EP 2005-751951	
20050606				
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CN 1972953	A	20070530	CN 2005-80021177	
20050606				
JP 2008503507	T	20080207	JP 2007-517124	
20050606				
BR 2005012571	A	20080325	BR 2005-12571	
20050606				
IN 2006DN07835	A	20070817	IN 2006-DN7835	
20061222				
KR 2007029263	A	20070313	KR 2007-701914	
20070125				
PRIORITY APPLN. INFO.:			EP 2004-14909	A
20040625				
			WO 2005-EP6064	W
20050606				
OTHER SOURCE(S):	CASREACT 144:129104; MARPAT 144:129104			
IC	ICM C07F009-50			
	ICS C07F015-00; B01J031-24; C07C043-225			
CC	29-7 (Organometallic and Organometalloidal Compounds)			
	Section cross-reference(s): 21, 67			
IT	2018-61-3P 3618-96-0P 10172-89-1P 17480-69-2P 22644-27-5P			
	24915-95-5P 38235-77-7P 56816-01-4P 86728-85-0P			
	90866-33-4P			
	RL: SPN (Synthetic preparation); PREP (Preparation)			

for (preparation of asym. substituted biaryldiphosphines as ligands  
transition metal catalyzed enantioselective hydrogenation)